ENGINEERING SCIENCE

1. Match the application to approximate numerical method.

Applications	Numerical Method
P1: Numerical Integration	M1: Newton-Raphson Method
P2: Solution to a transcendental equation	M2: Runge-Kutta Method
P3: Solution to a system of linear equations	M3: Simpson's $\frac{1}{3}$ rule
P4: Solution to a differential equation	M4: Gauss Elimination Method

(A) P1-M3, P2-M2, P3-M4, P4-M1
(B) P1-M3, P2-M1, P3,-M4, P4-M2
(C) P1-M4, P2-M1, P3-M3, P4-M2
(D) P1-M2, P2-M1, P3-M3, P4-M4

2. It is known that two roots of the non linear equation $x^3 - 6x^2 + 11x - 6 = 0$ are 1 and 3. The third root will be

(A) j
(B) $-j$
(C) 2
(D) 4

3. In the trapezoidal rule for numerical integration of a function, the nature of approximation used for the function in each interval is

(A) constant
(B) linear
(C) parabolic
(D) cubic

4. Newton-Raphson formula to find the roots of an equation $f(x)=0$ is given by

(A) $X_{n+1}=x_n-\frac{f(x_n)}{f'(x_n)}$

(B) $X_{n+1}=x_n+\frac{f(x_n)}{f'(x_n)}$

(C) $X_{n+1}=\frac{f(x_n)}{x_n f'(x_n)}$

(D) $X_{n+1}=\frac{x_n f(x_n)}{f'(x_n)}$

5. If $A-2B=\begin{bmatrix}1 & -2\\ 3 & 0\end{bmatrix}$ and $2A-3B=\begin{bmatrix}-2 & 2\\ -1 & -3\end{bmatrix}$, then B is equal to

(A) $\begin{bmatrix}6 & -4\\ -3 & 3\end{bmatrix}$

(B) $\begin{bmatrix}-4 & 6\\ 9 & -3\end{bmatrix}$

(C) $\begin{bmatrix}4 & -6\\ 3 & -3\end{bmatrix}$

(D) $\begin{bmatrix}-4 & -6\\ -3 & -3\end{bmatrix}$

6. The inverse of the matrix $\begin{bmatrix} 0.2 & 0 & 0 \\ 0 & 1 & 0 \\ 0 & 0 & 0.5 \end{bmatrix}$ is

(A) $\begin{bmatrix} 2 & 0 & 0 \\ 0 & 1 & 0 \\ 0 & 0 & 5 \end{bmatrix}$

(B) $\begin{bmatrix} -0.2 & 0 & 0 \\ 0 & -1 & 0 \\ 0 & 0 & -0.5 \end{bmatrix}$

(C) $\begin{bmatrix} 0.5 & 0 & 0 \\ 0 & 1 & 0 \\ 0 & 0 & 0.2 \end{bmatrix}$

(D) $\begin{bmatrix} 5 & 0 & 0 \\ 0 & 1 & 0 \\ 0 & 0 & 2 \end{bmatrix}$

7. If the variance of data is V, then its standard deviation is

(A) $\sqrt{V}$

(B) $\pm\sqrt{V}$

(C) $-\sqrt{V}$

(D) V^2

8. The following have the solution $\begin{bmatrix} 2 & 3 \\ 4 & 6 \end{bmatrix}\begin{bmatrix} x \\ y \end{bmatrix} = \begin{bmatrix} 8 \\ 16 \end{bmatrix}$

(A) $x = 1,\ y = 2$

(B) $x = y = 1$

(C) $x = y = 2$

(D) None of the above

9. The determinant of the matrix $\begin{bmatrix} 6 & -8 & 1 & 1 \\ 0 & 2 & 4 & 6 \\ 0 & 0 & 4 & 8 \\ 0 & 0 & 0 & -1 \end{bmatrix}$ is

(A) 11

(B) -48

(C) 0

(D) -24

10. The rank of the matrix given below is $\begin{bmatrix} 1 & 4 & 8 & 7 \\ 0 & 0 & 3 & 0 \\ 4 & 2 & 3 & 1 \\ 3 & 12 & 24 & 21 \end{bmatrix}$

(A) 3
(B) 1
(C) 2
(D) 4

11. Two trains A and B start from stations X and Y towards each other. B leaves station Y half an hour after train A leaves station X. Two hours after train A has started, the distance between trains A and B is $\frac{19^{th}}{30}$ of the distance between stations X and Y. How much time would it take each train (A and B) to cover the distance X to Y, if train A reaches half an hour later to its destination as compared to B?

(A) 8 hrs, 6 hrs
(B) 5 hrs, 4 hrs
(C) 10 hrs, 9 hrs
(D) 9 hrs, 8 hrs

12. The study of interactions between living organisms and environment is called as

(A) Ecosystem
(B) Ecology
(C) Phytogeography

(D) Phytosociology

13. Fossil fuels and metallic minerals are

(A) Renewable resources
(B) Inexhaustible resources
(C) Non-renewable resources
(D) None of the above

14. Extensive planting of trees to increase cover is called

(A) Afforestation
(B) Agroforestation
(C) Deforestation
(D) Social forestry

15. Harnessing of nuclear energy often causes

(A) Air pollution
(B) Water pollution
(C) Thermal pollution
(D) Noise pollution

16. Which of the following is a non-renewable resource?

(A) Coal
(B) Forests
(C) Water
(D) Wildlife

17. An ecosystem consists of

(A) green plants and animals
(B) green plants and decomposers
(C) producers and consumers
(D) green plants, animals decomposers and abiotic environment

18. Most stable ecosystem is

(A) Forest
(B) Desert
(C) Ocean
(D) Mountain

19. In a food chain animals constitute the

(A) First trophic level
(B) Second trophic level
(C) Intermediate trophic level
(D) Ultimate trophic level

20. New approach to conservation is the establishment of

(A) Sanctuaries
(B) Biosphere reserves
(C) National parks
(D) Reserve forests

21. Acid rain is caused by increase in the atmospheric concentration of

(A) Ozone and dust
(B) SO_2 and NO_2
(C) SO_3 and CO
(D) CO_2 and CO

22. Fluoride pollution mainly affects

(A) Kidney
(B) Brain
(C) Heart
(D) Teeth

23. Which of the following on inhalation dissolves in the blood haemoglobin more rapidly than oxygen.

(A) Sulphur dioxide
(B) Ozone
(C) Carbon monoxide
(D) Nitrous oxide

24. Nitrogen oxide and hydrocarbons released by automobiles interact to form

(A) Carbon monoxide
(B) Sulphur dioxide
(C) PAN
(D) Aerosols

25. Disease caused by eating fish inhabiting in mercury contaminated water is

(A) Bright's disease
(B) Minimata disease
(C) Hashimoto disease
(D) Osteosclerosis

26. Study of trends in human population growth and prediction of future growth is called

(A) Demography
(B) Biography
(C) Kalography
(D) Psychology

27. Dechlorination of water is achieved by adding

(A) Sodium thiosulphate
(B) Sodium sulphate
(C) Sodium hexametaphosphate
(D) Sodium bisulphate

28. When the coefficient of rugosity is increased from 0.01 to 0.02, the gradient of a pipe of a given diameter to carry the same flow at the same velocity will be

(A) increased by 4 times
(B) increased by 2 times
(C) decreased by $\sqrt{2}$ times
(D) decreased by 4 times

29. Zero hardness of water is achieved by

(A) Using lime soda process
(B) Excess lime treatment
(C) Ion exchange method
(D) Using excess alum dosage

30. Uniformity coefficient of filter sand is given by

(A) D_{50}/D_5
(B) D_{50}/D_{10}

(C) D_{60}/D_5
(D) D_{60}/D_{10}

31. Air-binding in rapid sand filters is encountered when

(A) there is excessive negative head
(B) the water is subjected to prolonged aeration
(C) the raw water contains dissolved gases
(D) the filter bed comprises largely of coarse sand

32. Storage of water by impounding is required where

(A) plenty of water is available in the stream in all seasons
(B) excess of suspended and dissolved matter are present in the water
(C) there is a large variation in quantity of the river flow from time to time
(D) the flow is uniform throughout the year but is insufficient

33. Which one of the following is the purpose of providing a surge tank in pipeline carrying water?

(A) To store water
(B) To increase the pressure throughout the pipeline
(C) To store overflowing water
(D) To protect the pipeline against water hammer

34. Water present in artesian aquifer is usually

(A) at sub-atmospheric pressure
(B) at atmospheric pressure
(C) at 0.5 times the atmospheric pressure
(D) above the atmospheric pressure

35. If the methyl orange alkalinity of water equals or exceeds total hardness, all of the hardness is

(A) non-carbonate hardness
(B) carbonate hardness
(C) pseudo hardness
(D) negative non-carbonate hardness

36. A commonly used hand pump is the

(A) centrifugal pump
(B) reciprocating pump

(C) rotary pump
(D) axial flow pump

37. The pathogens can be killed by

(A) Nitrification
(B) Lime-soda process
(C) Oxidation
(D) Chlorination

38. Two reservoirs at different levels are connected by two parallel pipes of diameter **2d** and **d**. The ratio of the flows in the two pipes (larger: smaller) is

(A) $\sqrt{2}:1$

(B) $2:1$

(C) $4:1$

(D) $4\sqrt{2}:1$

39. Which one of the following would contain water with the maximum amount of turbidity?

(A) Lakes
(B) Ocean
(C) Rivers
(D) Wells

40. The ideal residual pressure at the farthest consumer's tap in a properly designed water distribution system is in the range of

(A) 0.06 to 0.20 N/mm^2
(B) 0.21 to 0.25 N/mm^2
(C) 0.26 to 0.30 N/mm^2
(D) 0.31 to 0.35 N/mm^2

41. The yield of a well depend upon

(A) Permeability of soil
(B) Area of aquifer opening into the wells
(C) Actual flow velocity
(D) All of the above

42. Which of the following treatments reduce salinity of water?

1. Flash mixing and sedimentation
2. Electro dialysis
3. Reverse osmosis
4. Freezing
5. Filtration

Select correct answer using the codes given below:

(A) 1, 2, 3, 4 and 5
(B) 2, 3 and 4
(C) 1, 3 and 5
(D) 1, 2 and 4

43. A river is the source of water for water supply to a town. Its water is very turbid and polluted. The correct sequence of steps for treating the river water would be

(A) presedimentation -- prechlorination -- coagulation -- sedimentation -- nitration -- post-chlorination
(B) coagulation -- sedimentation -- post-chlorination
(C) coagulation -- filtration -- sedimentation -- post-chlorination
(D) sedimentation -- post-chlorination

44. Which of the following determinations are NOT necessary for raw water from a lake for use as source of supply of water for boiler feed?

1. Turbidity 2. Bacterial count 3. Iron 4. Hardness

Select correct answer using the codes given below:

(A) 1, 2 and 3
(B) 1, 2 and 4
(C) 1, 3 and 4
(D) 2, 3 and4

45. Which one of the following pairs is not correctly matched?

(A) Check valve: To check water flow in all direction
(B) Sluice valve: To control flow of water through pipe lines
(C) Air valve: To release the accumulated air
(D) Scour valve: To remove silt in a pipe line

46. Reciprocating pumps are suitable for

(A) high discharge and low heads
(B) low discharge and high heads
(C) low discharge and low heads
(D) high discharge and high heads

47. Which one of the following filters will produce water of higher bacteriological quality?

(A) Slow sand filter
(B) Rapid sand filter
(C) Pressure filter
(D) Dual media filter

48. Which of the following are the common problems associated with the operation of rapid sand filter?

1. Air binding
2. Cracking of sand beds
3. Bumping of filter beds
4. Mud balls

Select correct answer using codes below

(A) 1 and 2
(B) 2 and 3
(C) 2, 3 and 4
(D) 1, 2, 3 and 4

49. Consider the following valves in a water distribution system:

1. check valve
2. pressure reducing valve
3. air relief valve
4. Scour valve
5. Sluice valve

Which of the following work automatically?

(A) 1, 3 and 4
(B) 2, 4 and 5
(C) 3, 4 and 5
(D) 1, 2 and 3

50. Two long pipes in parallel are used to carry water between two reservoirs. The diameter of one pipe is twice that of the other. Both the pipes have the same value of friction factor. Neglect minor losses. What is the ratio of flow rates through the two pipes?

(A) 2.8
(B) 5.6
(C) 8
(D) 11.3

51. Which one of the following filters should be recommended for protected rural water supply project?

(A) pressure filter
(B) slow sand filter
(C) diatomaceous filter
(D) rapid sand filter

52. Match list I (type of pipe) with list II (purpose)

List I		List II
a. Steel pipe	1.	House plumbing
b. Cast iron pipe	2.	Hot water carrying
c. G.I.pipe	3.	Distribution main
d. PVC pipe	4.	Pumping main

Codes:

(A) a-4, b-1, c-2, d-3
(B) a-4, b-3, c-2, d-1
(C) a-2, b-1, c-4, d-3
(D) a-2, b-3, c-4, d-1

53. Which one of the following organisms is responsible for enteric fever?

(A) ECHO
(B) Salmonella typhi
(C) Entamoeba bistolytica
(D) Echinococcus

54. Which one of the following statements is correct?

If the specific gravity of a suspended particle is increased from 2 to 3, the settling velocity will,

(A) not change
(B) get doubled
(C) get increased by 1.5 times
(D) get increased by 2.25 times

55. Which one of the following is not a specific criterion for calculating surface overflow rate in sedimentation tank design?

(A) total quantity of water to be treated
(B) total surface area available in the tank
(C) total length of the tank
(D) total depth of the tank

56. Pickup the treatment process that has maximum BOD removal efficiency

(A) Waste stabilization pond
(B) Mechanically aerated lagoons
(C) Pasveer Type Oxidation Ditch
(D) Conventional treatment using trickling filters

57. Type II settling in water treatment is defined as

(A) Settling of discrete particles in dilute suspensions
(B) Settling of flocculent particles in dilute suspensions
(C) Settling of flocculent particles in concentrated suspensions
(D) Settling of particles in the form of sludge blanket

58. Two identical centrifugal pumps are operated in parallel so as to deliver into a common delivery pipe. Speed for both is also identical. At what total discharge (Q) and total head (H) will the system operate as compared to discharge and head of each of the pump operated singly?

(A) Both total Q and total H would increase, each approximately by 50%
(B) Total Q would be approximately doubled, but H would remain the same
(C) Total H would be approximately doubled, but Q would remain the same
(D) Total H would be doubled, but Q would be approximately halved

59. Which of the following is/are the characteristic(s) of coli form organism?

1. Bacillus 2. Gram-negative 3. Ferments lactose 4. Spore forming

(A) 1 alone
(B) 1, 2 and 4
(C) 1, 2 and 3
(D) 2, 3 and 4

60. The effective size (ES) of sand and its uniformity coefficient (UC) are usually specified parameters for sand filters. In slow sand filters as compared to rapid sand filters.

(A) ES is less but UC is more
(B) ES is more but UC is less
(C) Both ES and UC are more
(D) Both ES and UC are less

61. Circular sewers are economical up to a diameter

(A) 1.5 m
(B) 2.0 m
(C) 2.5 m
(D) 3.0 m

62. The permissible pH value for public water supplies may range between

(A) 5.5 to 8
(B) 5.5 to 6.0
(C) 7 to 8.5
(D) 8.5 to 10.5

63. The units of velocity gradient (G) is

(A) meter/sec
(B) kilo Watt/meter
(C) meter/hr
(D) per second

64. Which of the following is not a method of disinfection?

(A) Ozonation
(B) U.V. radiation
(C) desalination
(D) chlorination

65. A geological formation that may contain water but is incapable of transmitting significant quantities is

(A) Aquitard
(B) Aquifer
(C) Aquiclude
(D) Aquifuge

66. A mild steel pipe line 200 mm in diameter is carrying water with a velocity of 1.2 m/s. If friction factor is 0.02, the head loss per kilometer length of pipe line will be

(A) 5.1 m
(B) 7.34 m
(C) 74.38 m
(D) 73.4 m

67. The head loss in a pipe of diameter d, carrying water at a flow rate Q is **h**. If this pipe is replaced by another pipe with diameter d/2, the increase in head loss will be

(A) 1600%
(B) 400%
(C) 800%
(D) 3200%

68. A rising main is

(A) pipe which carries water from overhead to different floors in a building
(B) pipeline laid on rising gradient
(C) pumping main which carries water from lower level to higher level
(D) All of the above

69. Which of these is not a usual method of analysis of flow in water distribution networks?

(A) Hardy cross
(B) Newton-Raphson
(C) Linear theory
(D) Linear programming

70. Self-purification of running streams may be due to

(A) coagulation, flocculation and sedimentation
(B) dilution, sedimentation and oxidation
(C) dilution, sedimentation and filtration
(D) dilution, sedimentation and coagulation

71. The temperature of sewage affect the

(A) biological activity
(B) solubility of gases
(C) viscosity of sewage
(D) All of the above

72. Under drainage system is provided in

(A) Activate sludge process
(B) Slow sand filters
(C) Upflow filters
(D) None of the above

73. The multiplying factor usually adopted to obtain maximum hourly demand of water from the average hourly demand of water on the maximum day for the year is

(A) 1.5
(B) 1.8
(C) 2.0
(D) 2.7

74. Effluent of septic tank need to be treated with

(A) ASP
(B) soak pit
(C) sewage system
(D) oxidation pond

75. The velocity of flow of water in a sedimentation tank is about

(A) 5-10 cm/sec
(B) 15-30 cm/sec
(C) 15-30 cm/min
(D) 15-30 cm/hr.

76. The process of disalination of water, which makes use of microporous membrane is

(A) Electro dialysis
(B) Solar distillation
(C) Freezing
(D) Defluoridation

77. The hoop stress, σ developed in a pipe of diameter 'd' and wall thickness 't' due to internal pressure 'p' is given by

(A) ? = pd/2t
(B) ? = pt/2d
(C) σ = pd/t
(D) ? = pt/d

78. Activated carbon is used for

(A) disinfection
(B) removing hardness
(C) removing odour
(D) removing corrosiveness

79. The cast iron water mains are

(A) very much durable
(B) capable of withstanding high pressures
(C) liable to corrosion
(D) cheaper

80. The characteristics of fresh and septic sewage respectively are

(A) alkaline and acidic
(B) acidic and alkaline
(C) both acidic
(D) both alkaline

81. The economical diameter of a pumping or rising main is the one which ensures

(A) least cost of pipe
(B) least cost of pumping
(C) least cost of pipe and pumping together
(D) higher cost of pipe and least cost of pumping

82. Dilution factor 50 means

(A) 2% diluted sample
(B) 1% diluted sample
(C) 4% diluted sample
(D) 20% diluted sample

83. The economical diameter of a pipe, through which a discharge of 0.25 cumec is to be passed is

(A) 0.5 m
(B) 0.75 m
(C) 1.0 m
(D) 1.2 m

84. Alum is a coagulant which is found to be most effective when range of pH value of water is

(A) 2 to 4
(B) 4 to 6
(C) 6.5 to 8.5
(D) 8.5 to 10.5

85. The settling velocity of a spherical body, under laminar flow condition in water is given by

(A) Lacey's formula
(B) Darcy's law
(C) Hazen William's formula
(D) Stoke's law

86. Total hardness of drinking water, in general, should exceed

(A) 200 ppm
(B) 150 ppm
(C) 300 ppm
(D) 50 ppm

87. The presence of excess amount of nitrates in drinking water may cause a disease called

(A) methemoglobinemia
(B) fluorosis
(C) dental carries in children
(D) poliomyelitis

88. The coagulant, which is very effective for treating low pH water is

(A) alum
(B) chlorinated copperas
(C) copperas
(D) sodium aluminate

89. The maximum permissible limit for fluoride in drinking water is

(A) 0.1 mg/l
(B) 1.5 mg/l
(C) 5 mg/l
(D) 10 mg/l

90. Dissolved impurities in water consist of

(A) silt
(B) iron
(C) bacteria
(D) fungi

91. The most common cause of acidity in water is

(A) hydrogen
(B) oxygen
(C) carbon dioxide
(D) nitrogen

92. The method of analysis of water distribution system most suitable for long and narrow pipes is

(A) equivalent pipe method
(B) hardy cross method
(C) circle method
(D) dead-end method

93. For plain sedimentation tanks, the detention time ranges form

(A) 1 to 2 hours
(B) 2 to 2.5 hours
(C) 3 to 4 hours
(D) 4 to 8 hours

94. A pipe which is installed in the house drainage to preserve the water seal of trap is called

(A) vent pipe
(B) antisiphonage pipe
(C) waste pipe
(D) soil pipe

95. The presence of calcium chloride and magnesium chloride in water causes

(A) colour
(B) turbidity
(C) hardness
(D) coagulation

96. A horizontal tunnel constructed at shallow depth along the bank of a river to interrupt the ground water table is called

(A) infiltration gallery
(B) spring
(C) canal
(D) channel

97. The chloride demand of a water sample was found to be 0.6 mg/litre. The amount of bleaching powder containing 30% chloride to be added to treat 1 litre of such a water sample is

(A) 1.67 mg
(B) 1.50 mg
(C) 2 mg
(D) 1.75 mg

98. Which of the following forms of chlorine has no disinfectant property?

(A) Hypochlorous acid
(B) Hypocholorite ion
(C) Monochloranine
(D) Tricloramine

99. The suitable method for forecasting population for a large developed city is

(A) arithmetical increase method
(B) geometrical increase method
(C) comparative method
(D) incremental increase method

100. Most of the weather phenomenon take place in the

(A) stratosphere
(B) mesosphere
(C) troposphere
(D) ionosphere

101. The major quantity of rainfall in India is a

(A) convectional precipitation
(B) orographic precipitation
(C) cyclonic frontal precipitation
(D) cyclonic non-frontal precipitation

102. The percentage of total quantity of water in the world that of saline is about

(A) 71%
(B) 33%
(C) 67%
(D) 97%

103. Evaporation from the surface of a reservoir may be reduced by sprinkling

(A) methane
(B) spirit
(C) acetyl alcohol
(D) nitric acid

104. The 'starch-iodide' test is performed to identify

(A) residual chlorine
(B) residual iodine
(C) residual starch
(D) residual CO_2

105. Copper sulphate is used to control _____ in water

(A) algae
(B) bacteria
(C) silt
(D) minerals

106. Chlorination of water does not remove

(A) BOD
(B) dissolving oxygen
(C) organic matter
(D) ammonia content

107. Sunlight

(A) reduces turbidity
(B) increases dissolved oxygen
(C) impedes the growth of algae
(D) helps bacterial growth

108. The device used to measure the odour of water is

(A) Jackson's turbidimeter
(B) thermometer
(C) hydrometer
(D) osmoscope

109. The ratio of the yield of a rapid sand filter and that of a slow sand filter is of the order of

(A) 15
(B) 30
(C) 20
(D) 10

110. The commonly used material for water supply pipes, which has the property of being strong, not easily corroded, long life but heavy and brittle is

(A) steel
(B) cast iron
(C) copper
(D) reinforced cement concrete

111. For asbestos cement pipes the joint which is commonly used is

(A) flanged joint
(B) ring-tite coupling or simplex joint
(C) spigot and socket joint
(D) screwed socket joint

112. The water supply to a house being provided with the service connection pipe connected with the municipal water mains. The service connection comprises:

1) Stop-cock 2) Goose neck 3) Ferrule 4) Water meter

The correct sequence of these connections is

(A) 1,2,3,4
(B) 3,1,2,4
(C) 3,2,1,4
(D) 1,2,4,3

113. A foot valve is provided at the end of suction pipe of a centrifugal pump to prevent

(A) water from leaving and emptying the pump casing
(B) back flow of lifted water into the pump
(C) shudder and full loading of motor
(D) entry debris and sand into the pump

114. Turbidity is measured on

(A) standard cobalt scale
(B) standard silica scale
(C) standard platinum scale
(D) platinum cobalt scale

115. In disinfection which of the following forms of chlorine is most effective in killing the pathogenic bacteria?

(A) Cl
(B) OCl
(C) NH_2Cl
(D) HOCl

116. Two primary air pollutants are

(A) sulphur oxide and ozone
(B) nitrogen oxide and peroxyacetylnitrate
(C) sulphur oxide and hydrocarbon
(D) ozone and peroxyacetylnitrate

117. Two biodegradable components of municipal solid waste are

(A) plastics and wood
(B) cardboard and glass
(C) leather and tin cans
(D) food wastes and garden trimmings

118. A coastal city produces municipal solid waste (MSW) with high moisture content, high organic materials, low calorific value and low inorganic materials. The most effective and sustainable option for MSW management in the city is

(A) composting
(B) dumping sea
(C) incineration
(D) landfill

119. In the first stage of decomposition of organic matter is sewage, the product formed is

(A) carbon dioxide
(B) nitrates
(C) nitrites
(D) ammonia

120. The hydraulic mean radius of a circular sewer of diameter D is given by

(A) $\frac{D}{4}$

(B) $\frac{D}{2}$

(C) $\frac{D}{3}$

(D) $\frac{D}{6}$

121. If the dissolved oxygen concentration in a natural drainage falls to zero, it indicates the zone of

(A) recovery
(B) active decomposition
(C) degradation
(D) reduction

122. Air binding may occur in

(A) Aerators
(B) sludge digestion chambers
(C) sewers
(D) filters

123. The cross-section of a sewer for both the combined and separate system is

(A) circular
(B) semi-elliptical
(C) egg-shape
(D) horse-shoe shape

124. The dissolved oxygen sag curve shows

(A) dissolved oxygen deficit
(B) BOD deficit
(C) dissolved oxygen saturation
(D) BOD

125. The total volume of a primary settling tank is 2500 cubic metres and the rate of sewage flow is 24 x 10^6 litres/day. The detention time in the settling tank is

(A) 2.5 hours
(B) 2.4 hours
(C) 1.25 hours
(D) 1.04 hours

126. If the water content of sludge is reduced from 98% to 97%, the volume of the sludge is reduced by

(A) two-third
(B) half
(C) one-third
(D) one-fourth

127. From among the following sewage treatment options, the largest land requirement for a given discharge will be for

(A) anaerobic pond
(B) trickling filter
(C) oxidation ditch
(D) oxidation pond

128. The rainfall hyetograph shows the variation in the

(A) cumulative depth of rainfall with time
(B) rainfall depth with area
(C) rainfall intensity with time
(D) rainfall intensity with cumulative depth of rainfall

129. A catchment consists of 30% area with runoff coefficient 0.40 with the remaining 70% are with runoff coefficient 0.60. The equivalent runoff coefficient will be

(A) 0.48
(B) 0.54
(C) 0.63
(D) 0.76

130. For proper slow mixing in the flocculator of a water treatment plant, the temporal mean velocity gradient, 'G' recommendable is the order of

(A) 5 to 10 s^{-1}
(B) 20 to 80 s^{-1}
(C) 100 to 200 s^{-1}
(D) 250 to 350 s^{-1}

131. A circular sewer of diameter 1 m carries storm water at a depth of 0.75 m. The hydraulic radius is approximately

(A) 0.3 m
(B) 0.4 m
(C) 0.5 m
(D) 0.6 m

132. For fish habitat in a river, the minimum dissolved oxygen required is

(A) 2 mg/L
(B) 4 mg/L
(C) 8 mg/L
(D) 10 mg/L

133. The least expensive and most suitable excreta disposal unit for rural areas would be the

(A) soak pit
(B) pit privy
(C) leaching cesspool
(D) septic tank

134. Fresh sludge has moisture content of 99% and, after thickening, its moisture content is reduced to 96%. The reduction in volume of sludge is

(A) 3%
(B) 5%
(C) 75%
(D) 97%

135. A sewage sludge has a water content of 99%. The concentration of suspended solids in the sludge is

(A) 10 mg/l
(B) 100 mg/l
(C) 1000 mg/l
(D) 10,000 mg/l

136. Aerosol is

(A) carbon particles of microscopic size
(B) dispersion of small solid or liquid particles in gaseous media
(C) finely divided particles of ash
(D) diffused liquid particles

137. The sound pressure level for a jet plane on the ground with sound pressure of 2000μ bar should be

(A) 60 decibel
(B) 100 decibel
(C) 140 decibel
(D) 180 decibel

138. Which one of the following plume behaviours occurs when atmospheric inversion begins from the ground level and continues?

(A) Looping
(B) Fumigation
(C) Coning
(D) Fanning

139. Which one of the following pollutants or pairs of pollutants is formed due to photochemical reactions?

(A) CO alone
(B) O_3 and PAN
(C) PAN and NH_3
(D) NH_3 and CO

140. What type of noise can be abated by providing lining on walls and ceiling with sound absorbing materials?

(A) Source noise
(B) Reflection noise
(C) Structural noise
(D) Direct air-borne noise

141. The sewerage system originates from

(A) house sewers
(B) out fall sewer
(C) main sewers
(D) lateral sewers

142. The treatment unit which works on putrefaction alone (i.e. anaerobic decomposition) is

(A) contact beds
(B) septic tanks
(C) oxidation ponds
(D) tricking filters

143. When the temperature is more the dissolved oxygen contact (D.O.) of sewage gets

(A) reduced
(B) unaffected
(C) enhanced
(D) enhanced and then reduced

144. For a grit channel, if the recommended flow velocity is 0.25 m/s,and the detention period is 1 minute, then the length of tank is

(A) 15 m
(B) 25 m
(C) 240 m
(D) 0.25 m

145. The secondary treatment of the sewage is caused by

(A) bacteria
(B) algae
(C) coagulant
(D) gravitational pull

146. Elutriation is a process of

(A) sludge digestion
(B) filtration
(C) sedimentation
(D) washing digested sludge

147. "Symbiosis" the beneficial association between algae and bacteria is used for treatment of waste water in the

(A) activated sludge process
(B) rotating biological contactors
(C) anaerobic digester
(D) oxidation pond

148. The detention time in a septic tank is usually

(A) 1 – 2 hours
(B) 5 – 6 hours
(C) 18 – 24 hours
(D) 22 – 24 hours

149. The type of valve which allows water to flow in one direction but prevents its flow in the reverse direction is

(A) reflux valve
(B) air relief valve
(C) drain valve
(D) scour valve

150. The ventilation of sewers is needed to avoid the

(A) development of explosive mixtures of sewer gas
(B) build up of odourous gas
(C) danger of asphyxiation of sewer maintenance employees
(D) aerobic decomposition of organic materials

ENGINEERING SCIENCE - ANSWER KEY

TEST CODE: 607

QN. NO.	KEY	QN. NO.	KEY	QN. NO.	KEY	QN. NO.	KEY	QN. NO.	KEY
1	B	26	A	51	B	76	A	101	B
2	C	27	A	52	B	77	A	102	D
3	B	28	A	53	B	78	C	103	C
4	A	29	C	54	B	79	A	104	A
5	B	30	D	55	D	80	C	105	A
6	D	31	A	56	C	81	C	106	B
7	A	32	C	57	B	82	A	107	C
8	A	33	D	58	B	83	A	108	D
9	B	34	D	59	C	84	C	109	B
10	A	35	B	60	A	85	D	110	B
11	C	36	B	61	C	86	C	111	B
12	B	37	D	62	C	87	A	112	C
13	C	38	C	63	D	88	B	113	A
14	A	39	C	64	C	89	B	114	B
15	C	40	C	65	C	90	B	115	D
16	A	41	A	66	B	91	C	116	C
17	D	42	B	67	D	92	A	117	D
18	C	43	B	68	C	93	D	118	A
19	C	44	C	69	D	94	B	119	D
20	B	45	B	70	B	95	C	120	A
21	B	46	B	71	D	96	A	121	B
22	D	47	C	72	B	97	C	122	D
23	C	48	D	73	A	98	D	123	C
24	C	49	D	74	B	99	A	124	A
25	B	50	B	75	C	100	C	125	A

QN. NO.	KEY
126	C
127	D
128	C
129	B
130	B
131	A
132	B
133	D
134	C
135	D
136	B
137	C
138	D
139	B
140	B
141	A
142	B
143	A
144	A
145	A
146	D
147	D
148	D
149	A
150	C